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ABSTRACT

This paper describes the status of master's degree programs in information systems. An abstracted graduate model curriculum is also presented. Degree programs and course titles from more than 50 graduate information systems programs of universities and colleges were evaluated before a preliminary model was suggested. The model will be useful for academic executives and practitioners of information systems interested in benchmarking MS (Master's of Science) programs in colleges and universities, and for academic heads interested in introducing a new information systems program. Information systems faculty introducing new courses will also find the model useful. (Author)

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STATUS OF MASTER'S DEGREE PROGRAMS IN INFORMATION SYSTEMS

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This paper describes the status of master's degree programs in information systems. An abstracted graduate model curriculum is also presented. Degree programs and course titles from more than fifty graduate information systems programs of universities and colleges were evaluated before a preliminary model was suggested. The model will be useful for academic executives and practitioners of information systems interested in bench marking MS programs in colleges and universities, and for academic heads interested in introducing a new Information Systems program. Information Systems faculty introducing new courses will also find the model useful.

INTRODUCTION

The purpose of this report is to summarize the status of MS degree programs in Information Systems in the United States and to abstract a model curriculum. The ACM comprehensive curriculum recommendations for graduate programs in information systems were presented in reports of Ashenhurst (1972), and Nunamaker et al. (1982). The 1982 report described two master's degree program models: MBA and MS programs. Most schools use the MS as an "in-depth" degree as opposed to the "breadth" emphasis in the MBA. Many colleges and universities offer a graduate degree in Information Systems today. Several more are in the various stages of introducing a new one at present. Unfortunately, the last model curriculum recommendations for the graduate degree program in Information Systems was Nunamaker, et al (1982), fifteen years ago.

SCOPE

Only master's degree programs offering a major in Information Systems and located in the United States were considered. The MBA program is a fairly broad degree and envisions only limited specialization. Therefore, MBA programs and programs that offered a minor in Information Systems (IS) were not included in this study because they envision only limited specialization in Information Systems.

REVIEW OF THE 1982 IS CURRICULUM REPORT

The curriculum report (Nunamaker et al. 1982) describes the uniqueness of the IS curriculum, general prerequisites, degree programs and implementation.

The MS program with a major in Information Systems includes the AACSB common body of

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business knowledge and ten recommended Information Systems courses to prepare a student to become a systems designer. The MS program model provides sufficient time to develop an "in-depth" major with ten courses in IS.

The 1982 MS degree model program include the following prerequisites and course requirements:

General Prerequisites:

(a) finite mathematics, (b) elementary statistics, (c) elementary computer programming, (d) elementary economics, and elementary psychology.

Specific Prerequisites:

Computer programming and quantitative methods
AACSB Common Body of Knowledge

IS Technology Courses:

IS1 Computer concepts and Software Systems
IS2 Program, Data, and File Structures
IS4 Database Management Systems
IS6 Data Communications systems and Networks
IS7 Modeling and Decision systems

IS Concepts in Organizations

IS3 Information Systems in Organizations
IS5 Information Analysis
IS8 Systems Design Process
IS9 Information Systems Policy
IS10 Information Systems Projects

WHERE ARE WE AT THE MS LEVEL?

To recap at the MS level, the basic curriculum has been ACM's 1982 curriculum. While the ACM outline is still a useful reference what is in each course has changed drastically. Paul Gray addressed this issue at a recent conference (Gray, 1996). The external job market has changed—from people principally going to work in large mainframe shops inside companies to in-house IS, outsourced IS, software packages and system integrators. New technology has appeared, end-user, client/server, WWW, data warehouses, and more. New concepts have appeared or have become important: competitive and strategic use of IS, project management and teams. Some MS programs have become more technical while others are interested in change agent roles or the economics of computing. Organizations today continue to invest heavily in information technology and information resources.

In the light of these changes to the IS discipline, and the release of a revised AACSB standards for business accreditation (1994), the MS curriculum in IS needs to be revisited again. In this context, the IS curriculum research is introduced next.

USERS OF THE MS IS MODEL

The following stakeholders will find a graduate model curriculum in Information Systems useful.

- Academic executives of information systems interested in bench marking MS program with other colleges and universities.
- Academic heads of units where information systems programs are housed.
- Faculty interested in introducing a new Information Systems program.
- Information Systems faculty introducing new courses.
- Information systems practitioners.
- Information systems students.

EXIT OBJECTIVES FOR GRADUATES

It is valuable to define some exit objectives for graduates obtaining a Masters in Information Systems. Exit characteristics of information systems graduates have been identified in other studies (Ashenhurst 1972, Couger 1973, Nunamaker et al. 1982, Davis, Gorgone et al. 1997). The MS IS students should have hands-on experience in various aspects of software design and implementation, and comprehensive knowledge about the state-of-the-art in information technology. Note that many reports and surveys from the industry reveal that the business world today wants graduates with good technical skills (Lee et al. 1995, Maglitta 1995). The Master of Science in Information Systems programs should be able to produce graduates that meet the following IS needs of the business world:

- Broad business perspective, and business experience/skills
- Systems/IS skills, including hardware and software programming skills

- Communication/interpersonal/ team skills
- Analytical and thinking skills
- Real world experience/internship
- Cutting-edge technology knowledge and tools

Additionally, it is our expectation that students with an MS in IS degree program should be able to assist an organization deal with major information systems challenges such as assessing the information needs at different organizational levels within an organization, designing or fully participating in designing systems for an organization, creating an information systems architecture that aligns with the organization's goals and mission, and ultimately designing systems that people can control, understand, and use in a responsible manner.

Finally, Davis (1992) identifies the following four areas of competence for IS graduates:

- Recognize opportunities for use of information technology in business products, services, and processes.
- Interact effectively with the information infrastructure of an organization.
- Access and use information resources in his or her work.
- Select and use appropriate software.

RESEARCH METHODOLOGY

Our research methodology was to review all available Information Systems Curriculum in the United States that clearly offered a Masters in Information Systems. This study did not consider programs that offered only a minor in Information Systems. MBA programs consequently were not considered. The following sources were used to identify programs: Peterson's Guide to Graduate Programs in Business, Education, Health and Law (1996), Directory of MIS Faculty (1995), and the World Wide Web. The next set of tasks for the project included: The collection of college and university catalogs, brochures, general descriptions of information systems programs, and the classification of the programs with respect to a variety of attributes described below.

Each program was evaluated for the following general attributes:

- Where it is housed
- Degree name offered
- Number of semester hours
- Undergraduate pre-requisite degree required
- GMAT, GRE or GPA expectations if any.
- Prerequisite courses in the program
- Core courses in the program
- Additional courses often taught in the program

The IS '97 Information Systems curriculum coding scheme for course titles was used to classify the courses (Davis, Gorgone et al. 1997). This category is listed in Table 1: Coding Scheme.

TABLE 1

CODING SCHEME

Course Code	Course Title
IS97.PO	Knowledge Work Software Took Kit
IS97.01	Fundamentals of Information Systems
IS97.02	Personal Productivity with IS Technology
IS97.03	Information Systems Theory and Practice
IS97.04	Information Technology Hardware and Software
IS97.05	Programming, Data, File and Object Structures
IS97.06	Networks and Telecommunications
IS97.07	Analysis and Logical Design of an IS
IS97.08	Physical Design and Implementation with DBMS
IS97.09	Physical Design and Implementation with Programming Environments
IS97.10	Project Management and Practice

RESEARCH RESULTS

The search initially identified 170 schools that offered IS type programs. One hundred and twenty-four programs were identified as MBA programs or programs that offered a minor in IS and were eliminated from the study. The remaining, fifty-six programs were clearly identified as having a specialized masters degree in IS. Five colleges and universities had two distinct IS programs. For example, the MS CIS and the MS MIS were offered by the same institution. Therefore, in all, fifty-one universities or colleges were studied. Table 2 lists all the 51

TABLE 2
COLLEGES WITH IS PROGRAMS

Baruch College
Baylor University
Bentley College
Boson University
Brooklyn College
Cal Polytechnic Sate U. San Luis
Cal State Sacramento
Case Western Reserve
Claremont
Colorado State University
De Paul University
Easter Michigan University
Friends University
George Mason Univ.
Georgia Sate Univ.
Golden Gate
Hawaii Pacific University
Illinois Benedictine Col.
John Hopkins
Kean College
Marywood
Middle Tennessee State
Northern Illinois University
Nova Southeastern
Pace
Penn State Harrisburg
Regis University
Roosevelt
Sangamon St. University
Seattle Pacific University
Southern Illinois
Stern/NYU
Stevens
Strayer College
Texas A & M
Texas A & M International U.
U Virginia
U Illinois/ Chicago
U Miami
U Missouri, St. Louis
U of Wisconsin at Madison
U of Wisconsin at Whitewater
U. Arizona
U. Detroit mercy
U. of Colorado at Denver
U. Of Maryland Univ. College
U. of South Florida
U. Pittsburgh
West Coast University
West Paul Stillman
Western New England College

colleges and universities that were identified as having the 57 specialized masters in IS.

Where are the IS Degrees Housed?

Fifty-one percent of the master's in information systems programs are located in a business school. Forty-nine percent of the programs are located in other colleges such as arts and science, or in a stand-alone computing college. The IS programs that are located within a business school typically need to meet the accreditation standards of AACSB.

What Are the Different Degree Names for Information Systems?

Not unexpectedly, many different labels were used as a synonym for information systems programs. A sampling and count of the labels is presented The top three frequently used names were MS IS, MS MIS and MIS CIS. Interestingly, the remaining ten IS programs each had a unique name for its program, for example: MS Business Computer Information Systems, MS Management System Analysis, MS Management Studies, and MS Information Systems Management.

TABLE 3
SAMPLE DEGREE NAMES OFFERED

Degree Names	Frequency
MS IS	20
MS MIS	18
MS CIS	9
Unique Names	10

What Is the Frequency Distribution of IS Courses by IS'97 Code?

One of the primary goals of the research was to identify the common courses being taught within a IS program at the masters level. The frequency distribution of IS courses is presented in Figure 1. The graph summarizes the courses analyzed using the IS'97 code. The numbers 11 through 27 represents optional courses that are taught in the core. The list of optional courses is described in Table 4. The designation "O" represents optional courses. In the suggested model (see Figure 2)

they represent electives. As expected the electives range in variety, the most popular electives appear to be Accounting and Financial Information Systems, Policy, Thesis/Research, Operation Systems and Management of Computing Resources, Internship, and Organization Communication, Management & Leadership. Electives are frequently used to define an unique character to the IS program.

The percentages indicated in Figure 2 for the most frequently identified courses being taught is probably understated because the study only included the required courses (core courses) in the count. The following two examples illustrate why the frequency count is probably understated:

- If a course was offered as a prerequisite, it was not included in the count even though it was taught in the program. For example, IS97.07 Analysis and Logical Design course was found to be required in 82% of the programs in the core. In many instances this course was a prerequisite to the program when it was not found in the core.
- If a course was offered as an elective, it was not included in the count even though it was taught in the program as an optional course. For example, IS97.06 Networks and Telecommunications course was found to be required in only 52% of the programs in the core. In many instances this course was offered as an elective in the program.

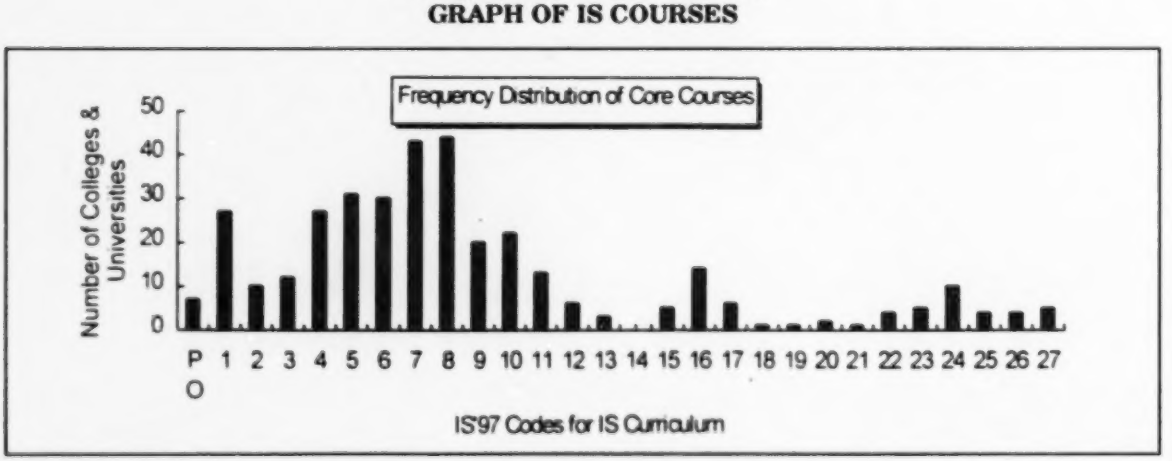
TABLE 4

LISTING OF OPTIONAL COURSES

Course Code	Course Title
O.11	Information Technology and Organization Strategy
O.12	Organization Management and Evaluation of Information Resources
O.13	Technology & Development of Client/Server Systems
O.14	Control, Audit and Security of Information Systems
O.15	Knowledge-Based Systems and Methods
O.16	Collaborative Work, Decision Support and Executive Support Systems
O.17	Human-Computer Interaction and Interface Design
O.18	Simulation Methods and Systems
O.19	Advanced Software and Hardware Architectures
O.20	Alternative Development Methods and Methodologies
O.21	IS Professionalism and Ethics
O.22	Accounting and Financial Information Systems
O.23	Policy
O.24	Thesis/Research
O.25	Operation Systems and Management of Computing Resources
O.26	Internship
O.27	Organization Communication, Management & Leadership

FIGURE 1

FREQUENCY DISTRIBUTION GRAPH OF IS COURSES


Frequency Distribution of Core Courses
Number of Colleges & Universities
50
40
30
20
10
0
P O 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
IS'97 Codes for IS Curriculum

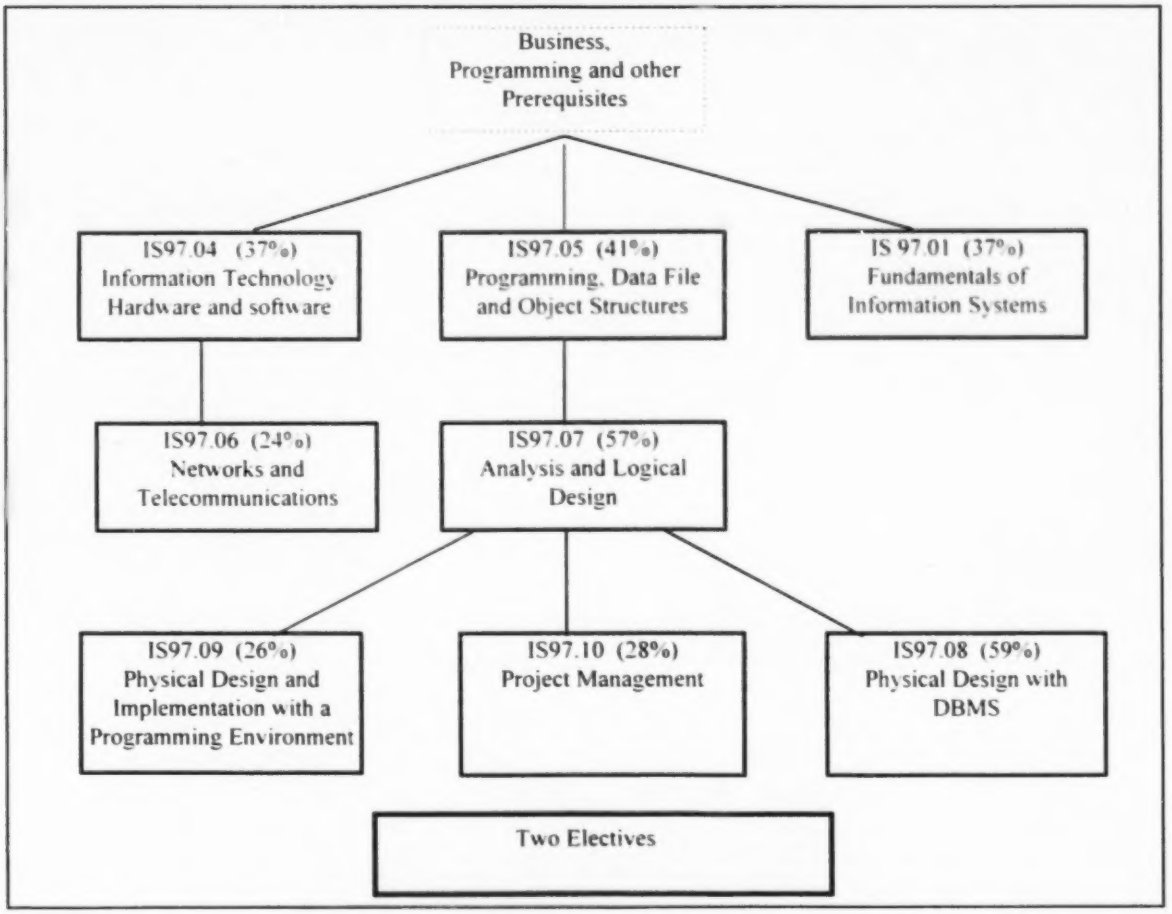
PROPOSED GRADUATE CURRICULUM MODEL FOR MS IS PROGRAMS

The study has abstracted eight core courses that are commonly used by MS IS programs. They are: The study has abstracted eight core courses that are commonly used by MS IS programs. They are:

- IS97.01 Fundamentals of Information Systems
- IS97.04 Information Technology Hardware and Software
- IS97.05 Programming, Data, File and Object Structures
- IS97.06 Networks and Telecommunications
- IS97.07 Analysis and Logical Design
- IS97.08 Physical Design and Implementation with DBMS
- IS97.09 Physical Design and Implementation with Programming Environments
- IS97.10 Project Management and Practice

In combination with two suggested electives from Table 4, a thirty semester credit framework is proposed. See Figure 2 for the entire model and the sequence of course. The model aligns well with the exit characteristics of graduates for IS programs described early on. The proposed model should satisfy the specialized masters degree program requirements of the AACSB standard (1994). According to the current standard each specialized master's program should require a minimum of 30 semester hours, of which at least 12 hours should be in the area of specialization.

FIGURE 2
SUGGESTED MODEL FOR IS CORE.
(Frequency Distribution is in brackets.)


Business, Programming and other Prerequisites
IS97.04 (37%) Information Technology Hardware and software
IS97.05 (41%) Programming, Data File and Object Structures
IS 97.01 (37%) Fundamentals of Information Systems
IS97.06 (24%) Networks and Telecommunications
IS97.07 (57%) Analysis and Logical Design
IS97.09 (26%) Physical Design and Implementation with a Programming Environment
IS97.10 (28%) Project Management
IS97.08 (59%) Physical Design with DBMS
Two Electives

COMPARISON WITH UNDERGRADUATE IS CURRICULUM

Table 1 lists the courses for the new undergraduate degree model curriculum in Information Systems Davis, Gorgone et al. 1997). Figure 2 lists the proposed graduate degree model. The undergraduate version of the IS program contains ten required courses in addition to the Knowledge Work Software Took Kit prerequisite. The proposed graduate program requires eight courses and two electives in addition to a variety of prerequisites. The two courses omitted from the graduate program are IS97.2 (Personal Productivity with IS Technology) and IS97.3 (Information Systems Theory and Practice). In addition to deletion of these two courses, the contents of six courses are modified for the graduate program. Contents of the other two courses are the same for both degree programs: IS97.4 (Information Technology Hardware and Software) and IS97.5 (Programming, Data File and Object Structures). IS97.1 (Fundamentals of Information Systems) at the graduate level combines material with IS97.2 (Personal Productivity with IS Technology). The prerequisites are different for both programs. For the courses common to both programs the principal differences in the graduate and undergraduate courses are the time spent on each topic, and level of instruction.

CONCLUSION

This research has described the status of master's degree programs in information systems. Fifty-six programs in fifty-one colleges and universities were identified as offering a specialized master's program. The study found where the degrees where housed, the different names used by the programs, and determined the common core courses offered by these programs. This paper has proposed a common model curriculum for current MS IS degree programs and has described exiting objectives for graduates. The next step in the process is to prepare a curriculum model that would provide guidelines for future curriculum direction for MS IS programs.

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